

REMARKS

Claims 1-24 are pending herein. By this Amendment, claims 1-9, 13, and 14 are amended, and claims 12 and 15-24 stand withdrawn. The amendments to claims 1-9, 13 and 14 involve the deletion of reference numerals. In addition, the amendments to claims 7 and 14 and the amendment of the specification correct $(W/10) \leq w_3 \leq (W/5)$ to $(W/10) \leq w_3 < (W/5)$ in the verified English translation. Support for the amendments to claims 7 and 14 and the specification is found in **PCT/JP2005/006268** at paragraphs [0025] and [0033] and at page 18, claim 7. No new matter is added by this Amendment. It is not believed that a Supplemental verified translation is needed, because the error occurs in a formula which is written in English in the Japanese text of **PCT/JP2005/006268**.

The Drawings

The Examiner has not made any objection to the drawings, however, the Office Action does not indicate the drawings as being acceptable by the Examiner. The Examiner is respectfully requested to indicate that the drawings are acceptable.

The Title

The Examiner has requested a more descriptive title of the invention. The title has been revised as requested by the Examiner. The revision is supported, for example, in the first paragraph of the present specification (Technical Field of the Invention).

The Restriction Requirement

The Examiner has maintained the restriction requirement and has acted upon elected method claims 1-11 and 13-14. The Examiner maintains that the claims have two technical features, one being a method for making a semiconductor wafer, and the other being a semiconductor wafer and therefore there are two inventions in the present application. However, if there are two inventions, that does not mean that the claims are properly restrictable. According to 37 C.F.R. § 1.475 (b)(3), a national stage application containing claims to different categories of invention will be considered to have unity of invention if the claims are drawn only to a product, and a process specially adapted for the manufacture of the said product. There is unity of invention and therefore the restriction is not proper. The Examiner also asserts that the inventions are separately classified and require a different field of search. However, just because the inventions are separately classified, that does not mean that the searches for the two inventions do not substantially overlap. If the searches substantially overlap then there is not a serious burden upon the Examiner to search for and act upon both inventions. The Examiner has not pointed out how the searches would differ in terms of specific different classes and subclasses. Also, withdrawn claims 12 and 15 to 24 are product-by-process claims and require the steps of elected method claims 1-11, respectively, so the searches should be the same.

The claims readable on the elected invention are method claims 1-11 and 13-14.

Reconsideration and withdrawal of the restriction requirement is respectfully requested.

Claim Objections

Claims 1-11 and 13-14 are objected to because according to the Examiner the epitaxial layer is grown by gradually reducing the temperature so the temperature range should be given in reducing manner and should therefore read “1150 to 400°C”. However, the temperature reduction does not start out at 1150°C and end at 400°C. The gradual temperature reduction involves both a starting temperature within the range 400 to 1150°C, and an ending temperature which is within the range 400 to 1150°C, but which is lower than the starting temperature. It is believed that the claim language accurately recites the gradual temperature reduction and correction is not needed. However, if the Examiner interprets the claim language differently it is respectfully requested that the Examiner call the undersigned to arrange for a telephonic interview to resolve any objections.

Claim Rejections

The Examiner indicates that claims 1 to 11, 13 and 14 are rejected based on Japanese Search Report document, JP 2003-218037 to Nobuhiro et al. However, some of these claims are rejected under 35 USC 102(a) and other of these claims are rejected under 35 U.S.C. 103(a), with claims 8 and 9 being rejected in view of Yamauchi et al.

Claims 1, 2, 4, 10, and 11 are rejected under 35 U.S.C. 102(a) as being anticipated by Nobuhiro et al JP 2003-218037. Claims 3, 5, 6, 7, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nobuhiro et al JP 2003-218037. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nobuhiro et al JP 2003-218037 in view of Yamauchi et al (U.S. Patent No. 6,495,294). These rejections are respectfully traversed.

Nobuhiro et al taken alone or in combination with Yamauchi et al does not teach or suggest applicants' claimed invention where a semiconductor wafer is produced by growing an epitaxial layer in a trench of a semiconductor wafer having a trench structure by gradually reducing the temperature in a temperature range of 400 to 1150°C or by gradually reducing the temperature and then lowering the temperature at a predetermined speed based on a vapor growth method while supplying a silane gas as a raw material gas, thereby filling the epitaxial layer in the trench. Nobuhiro et al forms a trench 3 in a silicon substrate 1, and an epitaxial film 4 is formed on the substrate 1. The inside of the trench 3 is then filled with overlapped epitaxial films 4, 5, and 6, by performing the partial etching of the epitaxial film 4 using vapor phase etching action of hydrogen chloride. Also, the epitaxial films 5 and 6 are formed a plurality of times, in an atmosphere maintained at a pressure which is higher than that set at formation of the film 4, in an atmosphere containing hydrogen chloride.

Furthermore, as shown in Fig. 3 of the Nobuhiro et al reference, the temperature is alternately raised and lowered, and not gradually reduced or progressively lowered in

three steps or more as shown in Figs. 2, 4, 6, and 8 of the present application. As discussed in the present specification (Verified English translation), in the paragraph bridging pages 5 and 6, the gradual reduction in temperature during epitaxial growth provides a diffusion quantity of an impurity contained in the semiconductor wafer into the epitaxial layer which is reduced in a stepwise manner from the first layer toward the third layer through the second layer. Accordingly, an influence of auto-doping from the semiconductor wafer to the epitaxial layer can be suppressed, thus obtaining desired electrical characteristics. Furthermore, as disclosed in the present specification (Verified English Translation at page 14 line 7 to page 18 line 3), restriction of the entire temperature range when growing the epitaxial layer by the vapor growth method to the range of 400 to 1150 °C avoids problems of polycrystallization or an increase in defects when the temperature is less than 400 °C and avoids the problem of deterioration in profile due to auto-doping when the temperature exceeds 1150°C. See also, paragraphs [0029], and [0050] to [0054] of the published application, US2007/0128836.

Yamauchi et al discloses a method for manufacturing a semiconductor substrate, by forming a trench in a semiconductor substrate; forming a first epitaxial film on a surface of the semiconductor substrate and in the trench; etching a part of the first epitaxial film; forming a second epitaxial film in the trench to fill the trench with the first epitaxial film and the second epitaxial film; and flattening the surface of the semiconductor substrate on which the first and second epitaxial films are formed. The part of the first epitaxial film is etched in an atmosphere including one of hydrogen chloride and hydrogen, by a gas phase etching action of the hydrogen chloride or

hydrogen. Even if Yamauchi et al is properly combinable with Nobuhiro et al, applicants' claimed process would not be obtained where an epitaxial layer in a trench of a semiconductor wafer having a trench structure is grown by gradually reducing the temperature in a temperature range of 400 to 1150°C or by gradually reducing the temperature and then lowering the temperature at a predetermined speed based on a vapor growth method while supplying a silane gas as a raw material gas, thereby filling the epitaxial layer in the trench.

Reconsideration and withdrawal of the rejection is respectfully requested.

CONCLUSION

In light of the foregoing remarks, this application is in condition for allowance, and early passage of this case to issue is respectfully requested. If there are any questions regarding this Amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application.

A request for a one month extension of time is being filed concurrently herewith.

It is not believed that any additional fees are due with this Amendment. However, any additional fees should be charged to, or any overpayment in fees should be credited

to, Deposit Account No. 19-0089 (P35795).

Respectfully Submitted,
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